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### REMARKS

This communication is filed in reply to the Office Action mailed 26 May 2005.

In the Office Action, the Examiner:

- (a) raised an objection to the amendment filed 8 March 2005 under 35 U.S.C. 132 as allegedly introducing new matter;
- (b) raised an objection to the claims under the first paragraph of 35 U.S.C. 112, concerning matter that the Examiner contends was not originally disclosed and thus comprises new matter; and
- (c) raised objections to the claims under 35 U.S.C. 103(a).

The Examiner is respectfully requested to reconsider and withdraw the objections having regard to the foregoing amendments and the following submissions.

#### **35 U.S.C. 132 Objections**

The Examiner's 35 U.S.C. 132 objections concern the paragraphs of the description at page 3, lines 20-23, page 3, lines 25-30 and page 3, lines 32-37. The Applicant does not admit that the matter introduced into such paragraphs in the 8 March 2005 Amendment constitute new matter as contended by the Examiner, but is prepared to delete such matter from such paragraphs in the interests of moving forward the prosecution of this application, and has done so in the herein Amendment. The Examiner is requested to reconsider and withdraw the 35 U.S.C. 132 Objections.

#### **35 U.S.C. 112, First Paragraph Objections**

The claims have been amended to remove reference to the following terms which the Examiner has objected to under the first paragraph, 35 U.S.C. 112: "more than 75 minutes" (claim 18 was canceled), "more than 200 minutes" (claim 64 was canceled), "at least 6

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hours" (claim 65 was canceled), "more than 22%" (claim 67 was canceled), "at least 60°C" (claim 69 was canceled), "at least 11 minutes" (claim 70 was canceled).

The Examiner has also objected to the term "free of ammonium ions and aluminum", which has been amended to "free of aluminum" with the herein amendment. This term appears in claims 55, 61 and 72, to which the Examiner has raised objections pursuant to the first paragraph of 35 U.S.C. 112. In this regard, the Applicant respectfully draws the Examiner's attention to the case of *Ex parte Parks*, 30 USPQ 2d 1234 (Bd. Pat. App. & Inter, 1993). In that case, the examiner had raised an objection under the first paragraph of 35 U.S.C. 112 because there was no literal basis for the claim limitation "in the absence of a catalyst". The Board reversed the examiner's objection under the first paragraph of 35 U.S.C. 112. The Board noted that "adequate description under the first paragraph of 35 U.S.C. 112 does not require *literal* support for the claimed invention" and that "in rejecting a claim for lack of adequate descriptive support, it is incumbent upon the examiner to establish that the originally-filed disclosure would not have reasonably conveyed to one having ordinary skill in the art that an appellant had possession of the now claimed subject matter." Further, the Board noted that "Clearly, the observation of a lack of literal support does not, in any of itself, establish a *prima facie* case for lack of adequate descriptive support under the first paragraph of 35 U.S.C. 112."

In this case, it cannot be said that the originally-filed disclosure would not have conveyed to one having ordinary skill in the art that the applicant had possession of the concept of the aqueous nitric acid solution being free of aluminum. For example, page 21, lines 34-36 of the original description explains the preparation of the nitric acid solution used in the Trials in Example 1 as being prepared with 70% (w/w) nitric acid and distilled water, i.e. free of aluminum. As there is no indication or mention in the application of any aluminum in the nitric acid solution, a claim providing that such solution is free of aluminum does not comprise new matter as contended by the Examiner. The Applicant's claimed invention is a novel and inventive improvement over prior art processes as it allows a high yield of pulp recovery while also allowing a high yield of lignin recovery, and does so without the need for aluminum as is taught by US Patent No. 4,652,341 (the "'341 Patent"), providing a process without the cost associated with an aluminum compound as disclosed in the '341

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Patent. The fact that the original disclosure did not *literally* state that the solution was "free of aluminum" does not by itself establish a *prima facie* case for lack of descriptive support.

As a result, it is submitted that, like *Ex parte Parks*, the Applicant's claims including the limitation "free of aluminum" comply with the first paragraph of 35 U.S.C. 112.

The Examiner has also objected to the term "consisting only of nitric acid and water". Claims 54 and 73 have been amended to use the transitional phrase "consisting essentially of" (or "consists essentially of"). This transitional phrase limits the scope of such claims to the specified materials and those which do not materially affect the basic and novel characteristics of the claimed invention. Page 21, lines 34-36 of the original description explains the preparation of the nitric acid solution used in the Trials in Example 1 as being prepared with 70% (w/w) nitric acid and distilled water. There is no mention or reference to other materials in the solution which would materially affect the basic and novel characteristics of the claimed invention. As such, the recitation of the nitric acid solution "consisting essentially of nitric acid and water" (or "consisting essentially of...") does not constitute new matter, but is supported by the description. The Applicant's claimed invention is a novel and inventive claimed combination of steps with particular nitric acid concentration in the solution, time and temperature parameters. It is clear from the '341 Patent that the aluminum compounds do materially affect the process disclosed in that patent, meaning that the Applicant's claimed process (with its higher nitric acid concentration compared with that of the '341 Patent) allows high yield of pulp recovery while also allowing a high yield of lignin recovery - with a solution consisting essentially of nitric acid and water. The Applicant's claimed methods are able to achieve their results without the need for aluminum as in the '341 Patent by reason of other patentable difference(s) between the Applicant's methods and that of the '341 Patent, such as the higher nitric acid concentration in the solution.

Thus, for reasons similar to that set out above in relation to the term "free of aluminum", it is submitted that the claims including the recitation of the nitric acid solution "consisting essentially of nitric acid and water" (or "consisting essentially of...") comply with the first paragraph of 35 U.S.C. 112.

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The Examiner has also objected to the term "at least 12 hours" which appears in claims 54 and 66 as comprising new matter. However, there is support for referring to the length of the impregnation stage of at least 12 hours. For example, the Examiner's attention is drawn to the original description at page 14, lines 23 - 34. 12 hours is specifically mentioned at page 14, line 28, and it is made clear at lines 25-26 ("...and may extend for any length of time before degradation of the wood chips begins to occur.") and line 33 ("...or up to 48 hours or longer...") that time periods in excess of 12 hours are contemplated. The term "for at least 12 hours" is not new matter. The Examiner is thus requested to reconsider and withdraw the 35 U.S.C. 112, first paragraph objection to this aspect.

The Examiner has also objected to "moisture content of 30% to 55% by weight" as allegedly not being originally disclosed and thus comprising new matter. However, there is support for this aspect in the original disclosure: see page 4, lines 26-27 and original claim 33. This is not new matter and the Examiner is thus requested to reconsider and withdraw the 35 U.S.C. 112, first paragraph objection to this aspect.

The Examiner has also objected to "11 to 59 minutes at or above the boiling point" as allegedly not being originally disclosed and thus comprising new matter. This aspect is claimed in claims 61 and 71, and refers to the length of time of the second heating stage wherein the lignocellulosic material is heated above boiling point of the nitric acid to distill off the nitric acid. There is support in the original disclosure for the claimed time range. In Trial 17 of Example 1 there was 11 minutes of "distillation time" (see page 29, line 13), providing support for the 11 minutes, and in Trial 1 of Example 1 there was 59 minutes of "distillation time" (see page 25, line 10), providing support for the 59 minutes. The remaining Trials in Example 1 show numerous other times between 11 and 59 minutes. Thus, there is support for the claimed "11 to 59 minutes at or above the boiling point of the nitric acid" aspect. This is not new matter and the Examiner is thus requested to reconsider and withdraw the 35 U.S.C. 112, first paragraph objection to this aspect.

The Examiner has also objected to the term "below 75 °C for at least 15 minutes" as not being originally disclosed. Claims 1 and 61 have been amended to replace "below 75 °C" with "up to 75 °C", which has support in the original disclosure: see page 3, line 35, page 15, line 32 and original claim 55. Claim 40 has been amended to replace "from about 50

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°C to below 75 °C " with "from about 50 °C to about 75 °C", the original wording of that claim prior to the 8 March 2005 amendment. Claim 54 has been amended to replace "below 75 °C " with "from about 50 °C to about 75 °C ", which has support: see page 3, line 35. The term objected to the Examiner also refers to "...for at least 15 minutes". This aspect has clear support in the original disclosure: see page 3, lines 36-37 and page 16, lines 29-32. Accordingly, the Examiner is requested to reconsider and withdraw the 35 U.S.C. 112, first paragraph objection.

The Applicant does not admit that the above terms deleted or replaced/amended constitute new matter, but is prepared to delete or replace/amend such terms in the interests of moving forward the prosecution of this application.

The Examiner is requested to reconsider and withdraw the 35 U.S.C. 112, first paragraph objections.

### 35 U.S.C. 103(a) Objections

Claims 18, 64, 65, 67, 69 and 70 have been canceled. Claims 1, 3-12, 14-17, 19-55, 57-62, 66, 68, and 71-73 are pending.

The Examiner has objected to all of the pending claims under 35 U.S.C. 103(a) and has cited U.S. Patent Nos. 4,652,341 (the "'341 Patent"), 5,424,417 (the "'417 Patent") and 4,584,057 (the "'057 Patent"). The Examiner has cited the '341 Patent against all claims in support of the 35 U.S.C. 103(a) objection, either alone (i.e. against claim 61) or in combination with the other references (i.e. in combination with the '417 Patent against claims 54, 55, 57-60, and in combination with the '057 Patent against claims 1, 3-12, 14-53, 62 and 64-73).

The Examiner is requested to reconsider and withdraw the 35 U.S.C. 103(a) objections in view of the following comments.

Each of the independent claims (1, 54, 55 and 61) in the present application requires that the nitric acid solution comprises a minimum of about 10% by weight of nitric acid (claims 54 and 61 require a minimum of 24.15% by weight of nitric acid.). At page 3 of the Office

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Action, the Examiner argues that the '341 Patent teaches nitric acid concentration of "about 10% to 40% by weight, e.g. 9% nitrate concentration by weight of wood" and the Examiner has referred to column 2, lines 30-35 of the '341 Patent. However, there is no indication in the passage cited by the Examiner that the "weight percent" refers to the amount of nitrate per weight of wood as contended by the Examiner, and there is no indication that the '341 Patent teaches or contemplates using a nitric acid solution having a nitric acid weight percentage of about 10% as required in the independent claims of the present application.

First, it is submitted that the reference to a weight percent as used in the '341 Patent would be understood by one skilled in the art to refer to the standard w/w % definition for a solution, i.e. weight of a particular solute/weight of the solution x 100. This is the typical reference given for concentrated solutions such as acids and bases, and it is submitted that one skilled in the art would understand the reference to "weight percent" in the '341 Patent would refer to the weight percent of the nitrate in the solution, not as a percent of the weight of the wood. If the inventor of the '341 Patent had intended that "weight percent" was to refer to the amount of acid per weight of wood as contended by the Examiner, then the inventor would in each instance be required to quantify in precise terms the metrics of the "wood" in question so that the teachings of the patent would be clear. In other words, the inventor of the '341 Patent would need to specify the particular wood in question, the moisture content of that wood, whether the particular wood was bone-dry, air-dry, etc. If "weight percent" in the '341 Patent was meant to refer to the amount of acid by weight of wood, then quantitative and qualitative analysis would be difficult or impossible. Since it is an important function of patents that members of the public should be able to understand the boundaries protected by a patent, it is inconsistent to suggest the inventor of the '341 Patent intended "weight percent" to have the definition suggested by the Examiner unless it was made unambiguously clear in the '341 Patent, which is not the case. In fact, taken as a whole the '341 Patent suggests the opposite, that the "weight percent" refers to the standard definition of a weight percent of the nitrate (e.g. nitric acid) in the nitrating solution.

Take, for example, column 7, lines 41-55 of the '341 Patent, which explains that the ratio of liquid nitrating agent to dry wood will range from about 5:1 to 10:1, and Example 8 in the '341 Patent (column 23, lines 67 - 68) which explains that the "flakes are submerged and cooked in about six times their weight of a solution of 5 weight percent nitric acid..."

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This latter reference makes clear that it is the solution having "5 weight percent nitric acid". See also column 24, lines 24-31 which explains that "the semi-pulped flakes are fed into a screw conveyor 17 which contains about six times their weight of a solution of about 1.5 weight percent nitric acid." Again, this makes clear that it is the solution having the "1.5 weight percent nitric acid." Also, see distinction which is made in each of Tables 3, 4 and 5 of the '341 Patent between "HNO<sub>3</sub> Strength, Wt%" and "Wt. Ratio, Acid to Fibrous Material". One skilled in the art would not interpret "HNO<sub>3</sub> Strength, Wt%" as meaning anything other than the weight percent of the acid in the solution, particularly since the Table also explicitly provides the ratios of acid to fibrous material.

As another example, see the wording of claim 11 in the '341 Patent which refers to an "aqueous nitric acid having an HNO<sub>3</sub> concentration of about 0.123 to 5.5 weight percent" which again suggests that the "weight percent" is the amount (or concentration) of HNO<sub>3</sub> in the "aqueous nitric acid."

It is submitted that it is clear from a review of the '341 Patent as a whole that the reference in such patent to a "weight percent" refers to the solution, and that the '341 Patent does not teach or contemplate a minimum nitric acid weight percentage of the solution of about 10% as claimed in the present application. Again, it would not have been obvious to modify the method disclosed in the '341 Patent to increase the weight percentage of nitric acid since the '341 Patent expressly states that the weight percentage is to be a maximum of about 9 (see column 3, lines 33-34), and since the disclosure of the '341 Patent appears to specifically teach away from increased concentration levels for reasons of low usage, cost and elimination of a recovery system (see column 3, line 43 - column 4, line 2). See also column 6, lines 51 - 59 where the disclosure states that "...it is preferred to use as dilute a nitrating agent as possible with the limiting factors of time and pulp quality factors considered, say having a nitrating agent concentration ranging from 0.05 or 0.3 to about 7.0 to 7.5 weight percent, preferably less than about 4.5 or 5 weight percent." Similarly, see also column 9, lines 28 - 56, where the disclosure states that at approximately atmospheric pressure conditions, the HNO<sub>3</sub> liquor concentration may be up to about 5.5 weight percent, preferably up to about 5 weight percent, and when employing elevated pressures, the HNO<sub>3</sub> concentration may be no more than about 7 to 7.5 weight percent.

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In this regard, the Examiner contends at page 5 of the Office Action that "PRIOR teaches that the  $\text{HNO}_3$  concentration of the solution could be up to 91%, see column 20, lines 17-22 (10 parts 100%  $\text{HNO}_3$  and 1 part 100% aluminum sulphate)". With respect, the passage cited by the Examiner does not teach a solution having a nitric acid weight percentage of up to 91%, but merely gives a ratio of nitric acid to aluminum sulphate of 10:1 in the solution. This passage does not exclude other components in the solution, as evidenced by the use of the open-ended word "comprising". For example, see col. 25, lines 40-43: "...where the flakes are submerged and cooked in a solution of 5 weight percent nitric acid to which has been added aluminum sulfate in the ratio of 1 part aluminum sulfate to 10 parts nitric acid." This passage makes clear that the 10:1 ratio is simply that between the nitric acid and aluminum sulfate and that the solution comprises other components (e.g. because the solution has only 5 weight percent nitric acid). The obvious other component in the solution is water: see for example claim 2 in the '341 Patent ("...an *aqueous* nitric acid solution containing an aluminum compound..."). See also claims 12 in the '341 Patent which refer to "*aqueous* nitric acid having a  $\text{HNO}_3$  concentration of...weight percent" and then referencing a ratio of the aluminum sulphate to  $\text{HNO}_3$ . See also Examples 25-30 and Table 5 of the '341 Patent. In each example the nitric acid contains 1 part aluminum sulphate for each 10 parts of  $\text{HNO}_3$  (col. 28, lines 16-17), yet the concentration of the solution is not given as 91%, but as ranging between 1.0 - 4.4 (in Table 5).

Further still, a solution comprising "up to 91%" nitric acid as contended by the Examiner would imply the nitric acid component of the solution would be comprised of a super-concentrated nitric acid, such as fuming nitric acid, beyond the usual bulk commercial grade nitric acid which is typically 67-70%. However, there is no mention of such a super-concentrated nitric acid in the '341 Patent, and in fact the '341 Patent teaches away from the use of such super-concentrated chemicals, including for cost reasons: see col. 1, lines 49-56, and see also column 3, lines 43-45 ("Since the cooking liquors of this invention are simple solutions of purchased or off-the-shelf chemicals, no complex system of liquor manufacture or control is necessary."). Since the cost of red fuming nitric acid is prohibitively more expensive than commercial grade nitric acid, i.e. more than 1000 times more expensive, and since red fuming nitric acid requires extreme care, it is most unlikely that the inventor of the '341 Patent intended to use such an expensive and volatile chemical in a pulping process. Further still, red fuming nitric acid is typically used as an oxidizing agent, but the '341 Patent specifically states that the nitrate ion (nitric acid) is intended to



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nitrate the ligneous component (e.g. adding a nitrate group to a benzene ring), something which is not an oxidation reaction.

It is submitted that the '341 Patent does not disclose or teach the use of a solution comprising "up to 91%" nitric acid as contended by the Examiner.

Further still, even if the "weight percent" (0.125 to 9) in the '341 Patent did refer to the amount of acid by weight of wood (which is denied) this would still translate to a much lower acid concentration in the solution of the '341 Patent than claimed in the present application. As an example, all of the trials (except Trial 19) in Example 1 of the present application have a starting weight of 200 grams of wood chips, and all of Trials used 1 L of impregnation solution (with the exception that Trials 17 and 18 used 750 mL and Trial 19 used 2250 mL). 9% of 200 grams is 18 grams, representing the hypothetical amount of nitric acid in a solution prepared according to the Examiner's interpretation of the '341 Patent. Now, assuming that only 500 mL of solution was used in the impregnating step (though it is doubtful that this would be sufficient to submerge 200 grams of wood chips), and that the weight of the solution was 500 grams, then would mean that solution was only 3.6% by weight of nitric acid ( $18 \text{ grams} / 500 \text{ grams} \times 100\% = 3.6\%$ ), which is far less than the claimed weight percentages of the present invention. If 1 L was used, then the solution would have 1.8% by weight of nitric acid. Thus, even assuming that the reference to "weight percent" in '341 Patent was intended to refer to the amount of acid by weight of wood (which is denied), and even using very generous assumptions (e.g. only 500 mL of solution for 200 grams of chips, 0% moisture content in the chips, highest end in the 0.125 - 9% range), it is clear that the '341 Patent does not teach or suggest the use of a solution comprising a minimum of about 10% by weight of nitric acid as required by each of the independent claims in the present invention (claims 54 and 61 require a minimum of 24.15% by weight of nitric acid.).

Accordingly, it is submitted that each of the independent claims (1, 54, 55, 61) in the present application claim novel and inventive subject matter. There is no motivation or suggestion in the '341 Patent, alone or in combination with the other cited references, to arrive at the Applicant's claimed nitric acid weight percentages, and in fact, the '341 Patent appears to specifically teach away from this important aspect of the Applicant's claimed invention.

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Another patentable distinction between the present invention and the '341 Patent is the absence of the need for an aluminum compound, which is used to augment the nitric acid in the method of the '341 Patent: see, for example, column 7, lines 8-10, column 4, lines 29-32 and column 2, lines 34-35. Claims 55 and 61 claim that the aqueous nitric acid solution is free of aluminum, and claims 54 and 73 claim that the aqueous nitric acid solution consists essentially of nitric acid and water. It is clear from the disclosure of the '341 Patent that the aluminum compound has a material effect on the methods described therein, see, for example, column 3, lines 17-20 and column 4, lines 29-32. It is important that the Applicant's claimed methods can achieve the yields of pulp and lignin without the need for such aluminum compounds, since there will be costs saved by the omission of this component of the solutions from the '341 Patent.

Yet another patentable difference between the methods claimed in the present invention and the method described in the '341 Patent is the temperature during the heating stages following impregnation. Dependent claims 15 and 16 in the present application claim heating the lignocellulosic material at a temperature below 75 °C for at least 15 minutes in a heating stage in step (b) (claim 15 claims heating between 60 °C and 70 °C while claim 16 claims heating between 50 °C and 60 °C). The '341 Patent discloses heating at or below 70 °C (see column 6, lines 63-68) in the impregnation step (which is carried out prior to the cooking nitration step) but not in the cooking nitration step. The '341 Patent specifically teaches heating at higher temperatures in the cooking nitration step than the claimed ranges in claims 15 and 16: heating below 75 °C during the nitrating cooking step is taught away from because it would take "excessive reaction time": see column 7, line 56 - column 8, line 5.

Yet another patentable difference between the methods of the present invention and the '341 Patent are the relatively prolonged impregnation periods with the nitric acid solution prior to the heating and alkaline digestion steps. For example, claims 4 and 54 claim impregnation periods of at least 12 hours, and there is nothing comparable suggested or taught in the '341 Patent. The Applicant's relatively modest reaction temperatures and pressures allow such a prolonged impregnation periods for the Applicant's methods, which allow relatively high pulp and lignin recovery yields.

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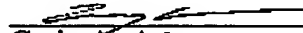
Accordingly, it is submitted that each of the independent claims 1, 54, 55 and 61 in this application define novel and inventive subject-matter and should be allowable. The Examiner is thus respectfully requested to withdraw the 35 U.S.C. 103(a) objections to these claims. It is also submitted that the remaining claims in the application should also be allowable, as they depend on claims which should be allowable.

Other minor amendments have been made to claims 54, 61 and 68.

In view of the amendments and submissions presented above, the Applicant submits that this application is in condition for allowance and respectfully requests reconsideration and allowance of this application.

Respectfully submitted,

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